

In the claims:

1. (Currently Amended) A process for removing at least one of thiophene and thiophene compounds from liquid fuel, the method comprising the step of:

contacting the liquid fuel with an adsorbent which preferentially adsorbs the at least one of thiophene and thiophene compounds, at a selected temperature and pressure, thereby producing a non-adsorbed component and a thiophene/thiophene compound-rich adsorbed component, wherein the adsorbent comprises at least one of a metal and a metal ion, the at least one of metal and metal ion adapted to form π -complexation bonds with the at least one of thiophene and thiophene compounds, an ion-exchanged zeolite selected from the group consisting of zeolite X, zeolite Y, zeolite LSX, and mixtures thereof, the zeolite having exchangeable cationic sites, and at least some of the sites having d-block transition metal cation present, and wherein the preferential adsorption occurs by π -complexation;

~~wherein the liquid fuel is at least one of unleaded gasoline and diesel fuel;~~

and wherein, prior to contacting the liquid fuel with the adsorbent, the process comprises pretreating the adsorbent, the pretreatment process comprising the steps of:

calcining the adsorbent between about 350°C and about 450°C in an inert, dry atmosphere for an amount of time ranging between about zero hours and about 20 hours; and then

cooling the adsorbent ~~in a dry atmosphere.~~

2. (Original) The process as defined in claim 1 wherein the amount of calcining time ranges between about 5 hours and about 15 hours.

3. (Original) The process as defined in claim 1 wherein the amount of calcining time is about 10 hours.

4. (Original) The process as defined in claim 1 wherein the selected temperature and pressure is ambient temperature and ambient pressure.

5. (Original) The process as defined in claim 1, further comprising the step of adding a guard bed adjacent an inlet to the adsorbent such that the liquid fuel contacts the guard bed prior to contacting the adsorbent.

6. (Original) The process as defined in claim 5 wherein the guard bed has as a main component thereof at least one of activated carbon, activated alumina, silica gel, zeolites, clays, pillared clays, diatomaceous earth, porous sorbents, and mixtures thereof.

7. (Original) The process as defined in claim 1 wherein the thiophene compounds include at least one of thiophene, methyl-thiophene, benzothiophene, methyl-benzothiophene, dibenzothiophene, 4-methyl-dibenzothiophene, 4,6-dimethyl-dibenzothiophene, 3,6-dimethyl-dibenzothiophene, and mixtures thereof.

8. (Original) The process as defined in claim 1 wherein at 10^{-5} atm, the adsorbent adsorbs more than about 1 mmol/gram of thiophene.

9. (Currently Amended) ~~A process for removing thiophene compounds from liquid fuel, the method comprising the steps of:~~

~~contacting the liquid fuel with an adsorbent which preferentially adsorbs the thiophene compounds, at a selected temperature and pressure, thereby producing a non-adsorbed component and a thiophene compound-rich adsorbed component;~~ The process as defined in claim 1 wherein the adsorbent comprising comprises a carrier having a surface area, the carrier having a monolayer of a d-block transition metal compound dispersed on substantially the entire surface area, the metal compound releasably retaining the at least one of thiophene and thiophene compounds; and the carrier comprising a plurality of pores having a pore size greater than the effective molecular diameter of the at least one of thiophene and thiophene compounds; and wherein the process further comprises the step of changing at least one of the pressure and temperature to thereby release the thiophene/thiophene compound-rich component from the adsorbent;

~~wherein the liquid fuel is at least one of unleaded gasoline and diesel fuel; and wherein, prior to contacting the liquid fuel with the adsorbent, the process comprises pretreating the adsorbent, the pretreatment process comprising the steps of:~~

~~calcining the adsorbent between about 350°C and about 450°C in an inert, dry atmosphere for an amount of time ranging between about 5 hours and about 15 hours; and then~~

~~cooling the adsorbent in a dry atmosphere.~~

10. (Original) The process as defined in claim 9 wherein at 10^{-5} atm, the adsorbent adsorbs more than about 1 mmol/gram of thiophene.

11. (Original) The process as defined in claim 9 wherein the amount of calcining time is about 10 hours.

12. (Original) The process as defined in claim 9, further comprising the step of adding a guard bed adjacent an inlet to the adsorbent such that the liquid fuel contacts the guard bed prior to contacting the adsorbent.

13. (Original) The process as defined in claim 12 wherein the guard bed has as a main component thereof at least one of activated carbon, activated alumina, silica gel, zeolites, clays, pillared clays, diatomaceous earth, porous sorbents, and mixtures thereof.

14. (Original) The process as defined in claim 9 wherein the thiophene compounds include at least one of thiophene, methyl-thiophene, benzothiophene, methyl-benzothiophene, dibenzothiophene, 4-methyl-dibenzothiophene, 4,6-dimethyl-dibenzothiophene, 3,6-dimethyl-dibenzothiophene, and mixtures thereof.

15. (New) The process as defined in claim 1 wherein the liquid fuel is at least one of unleaded gasoline and diesel fuel.

16. (New) The process as defined in claim 1 wherein the adsorbent comprises an ion-exchanged zeolite selected from the group consisting of zeolite X, zeolite Y, zeolite LSX, and mixtures thereof, the zeolite having exchangeable cationic sites, wherein at least one of the sites has at least one d-block transition metal cation present.

17. (New) The process as defined in claim 16 wherein the adsorbent is at least one of Cu(I)Y zeolite and Ag(I)Y zeolite.

18. (New) The process as defined in claim 9 wherein the adsorbent carrier is silica and wherein the metal compound is silver nitrate.

19. (New) The process as defined in claim 1 wherein the method further comprises the step of changing at least one of the pressure and temperature to thereby release the thiophene/thiophene compound-rich component from the adsorbent.

20. (New) The process as defined in claim 1 wherein, before contact with the adsorbent, the liquid fuel has a high concentration of aromatic compounds, and a low concentration of thiophene/thiophene compounds.

21. (New) A method for removing aromatic compounds from a mixture containing aliphatic compounds and the aromatic compounds, the method comprising the step of:

contacting the mixture with an adsorbent which preferentially adsorbs the aromatic compounds, at a selected temperature and pressure, thereby producing a non-adsorbed component and an aromatic compound-rich adsorbed component, wherein the adsorbent includes at least one of a metal and a metal ion, the at least one of metal and metal ion adapted to form π -complexation bonds with the aromatic compounds, and wherein the preferential adsorption occurs by π -complexation.

22. (New) The method as defined in claim 21 wherein the aromatic compounds comprise at least one of benzene and cyclohexane.

23. (New) The method as defined in claim 21 wherein the adsorbent comprises an ion-exchanged zeolite selected from the group consisting of zeolite X, zeolite Y, zeolite LSX, and mixtures thereof, the zeolite having exchangeable cationic sites, wherein at least one of the sites has at least one d-block transition metal cation present.

24. (New) The process as defined in claim 23 wherein the adsorbent is a Ag(I)Y zeolite.